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REPORT ON THE 1961 WESTERN HEMLOCK LOOPER EGG SURVEY IN CLATSOP, COLUMBIA, AND TILLAMOOK COUNTIES OF OREGON

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INTRODUCTION

The western hemlock looper, Lambdina fiscellaria lugubrosa Hulst., is a very destructive defoliator in the spruce-hemlock forests along the coast of Oregon, Washington, and British Columbia. During the last 70 years, this geometrid moth has figured in four or five major outbreaks and several minor ones. An outbreak in Tillamook County in 1918-21 killed 500 million board feet of western hemlock and Douglas-fir. About 200 million board feet of hemlock were killed in an outbreak in Pacific and Grays Harbor Counties, Washington, from 1929 to 1932. The last outbreak was in Clatsop County, Oregon, between 1943 and 1945. This outbreak was controlled by aerial applications of lead arsenate and DDT on some 12,000 acres.

In the fall of 1961, the presence of western hemlock looper moths and tree defoliation in Clatsop County, Oregon, was reported by Crown Zellerbach Corporation foresters. Entomologists and foresters from the Insect and Disease Control Branch, Division of Timber Management, U. S. Forest Service and Oregon Department of Forestry examined defoliated areas with the Crown Zellerbach Corporation foresters and decided that a survey to determine the limits of the looper infestation was necessary.

Western hemlock looper moths appear in late September and in October, mate and lay eggs. The females deposit their eggs on moss and lichens in the crowns of host trees and on moss on understory plants and trees. The eggs are coated with a sticky substance and adhere to the moss or lichen (Figure 1). Because moss was abundant and easy to collect in the mature and overmature coastal hemlock stands, a sampling system was devised using this plant as the sampling medium.

Sampling points were selected in the office from timber type maps of Clatsop, Columbia, and Tillamook Counties that were furnished by Crown Zellerbach Corporation and the Oregon Department of Forestry. Points were selected at 145 locations within hemlock stands or mixed stands containing hemlock. No sampling points were chosen in stands less than 60 years old. The purpose of the survey was to find out where and in what numbers hemlock looper eggs occurred over this area. This information would be used to help determine the zone of infestation and spray boundaries. The methods used in collecting and processing moss samples and the results of the survey are given in this report.

Figure 1 - Western hemlock looper egg adhering to moss.

METHODS

Collecting and Drying Moss

Field collections of moss were begun in November after the moth flight was completed. Foresters and entomologists from the Insect and Disease Control Branch of the U. S. Forest Service joined with foresters from Crown Zellerbach Corporation, at Seaside, and from the Oregon Department of Forestry at Salem and Astoria to make the collections. Moss samples were collected at 123 points in Clatsop, Columbia, and Tillamook Counties by these personnel. Samples at 22 of the original 145 points were not collected due to inaccessibility or lack of moss in these areas.

At each sampling point, a 12"x30" polyethylene bag was filled with various types of moss. The material was collected from lower branches and boles of conifers and branches of vine maple, alder, and other deciduous plants. The time needed for one person to collect a full bag of moss varied from 15 to 45 minutes, depending on the availability of moss in the particular area.

After the moss samples were collected, they were brought to the U. S. Forest Service Sellwood Laboratory in Portland to be processed. In most instances, the moss was almost completely saturated and needed to be dried before being processed. Samples were spread out on newspapers on the floor of a room kept at temperatures ranging from 70 to 90°F. The material was turned at least once to provide thorough drying. Some samples were placed on door screens to allow drying of both sides at once. After each sample was completely dry, it was placed back into a plastic bag to await processing. Drying time ranged between 5-10 days, depending on the moisture content of the moss when it was collected.

Processing

The processing of field samples will be described step by step, so that the methods can be used in subsequent surveys.

Step 1 - One-pound of dry moss was weighed from each sample (Figure 2) and placed in a specially constructed wooden box (34"x15"x6") (Figure 3). The box contained a coarse screen which held the moss in place while it was being pulverized, using a belt sander (Skil Model 448)1/ with a 3" wide belt (Type A, Grit 3) (Figure 4).

Respirators were worn during all stages of processing to protect workers from moss dust.

1/ Use of brand names here and elsewhere in this report does not imply endorsement by the Forest Service.

Figure 2 - Weighing one pound of moss from field sample for processing.

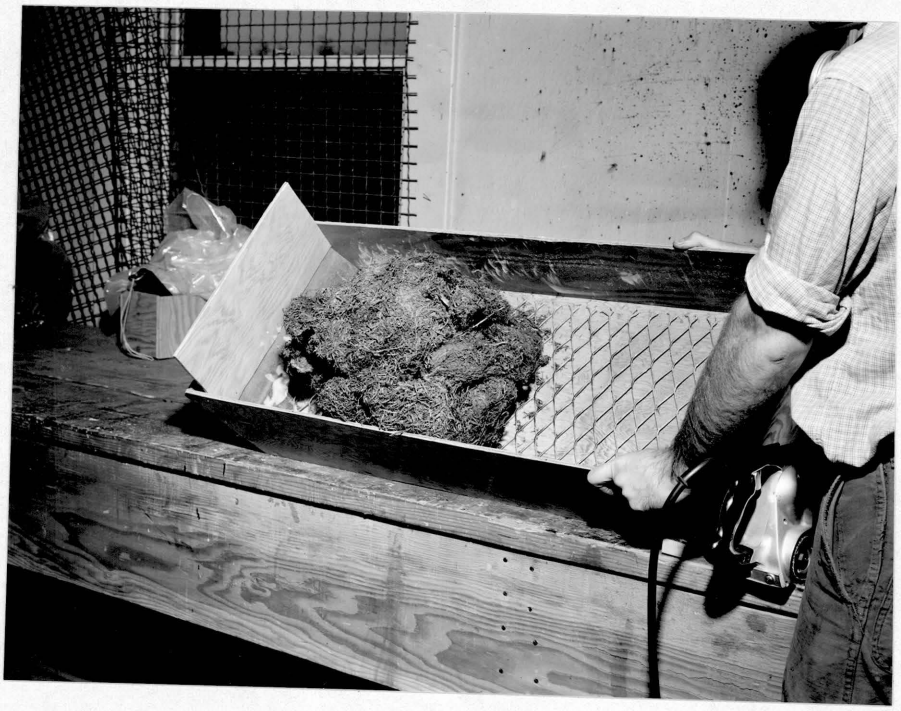

Figure 3 - Box used to hold moss while it was pulverized.

Figure 4 - Pulverizing moss using a belt sander.

Step 2 - The pulverized moss from Step 1 was sifted through 8-mesh and 11-mesh screens (Figure 5). Material retained by these screens was discarded.

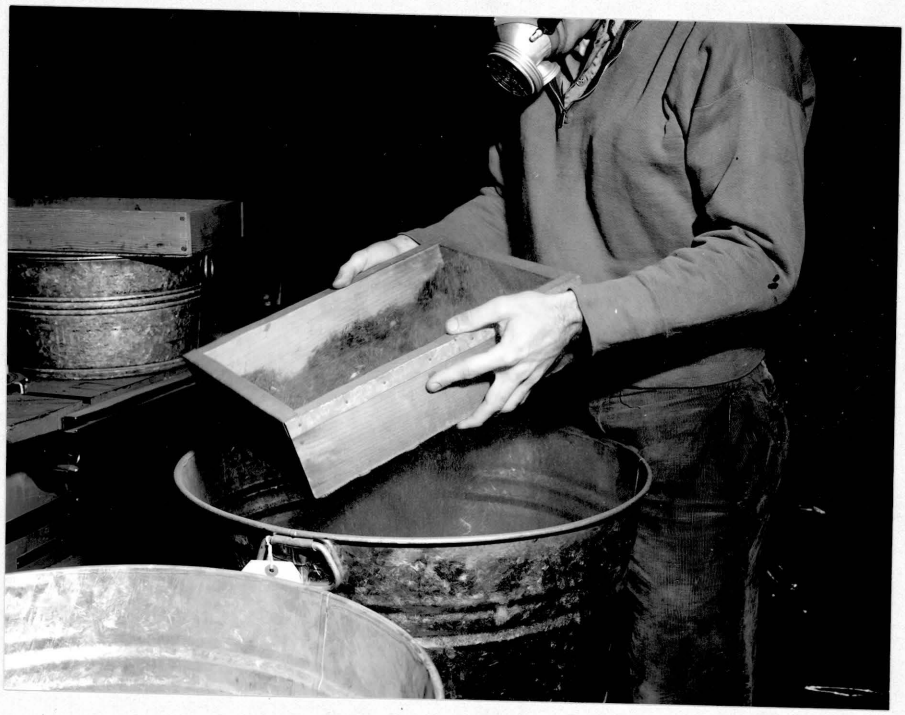

Figure 5 - Sifting moss through an 8-mesh screen.

Step 3 - The remaining material from Step 2 was fed into a Viking grain cleaner that was modified for the egg separation project (Figure 6). This shaking apparatus contained 14- and 20-mesh screens. Residue was blown off by a fan, and the useable material was deposited in a pan underneath the machine (Figure 7).

Figure 6 - Feeding moss into a Viking grain cleaner.

Figure 7 - Useable material after going through the Viking grain cleaner.

Three adjustments of the grain cleaner were necessary for its proper operation:

a. Feed - To regulate moss discharge, turn knob attached to one of the machine's legs. Best setting was that which allowed a slow rate of moss discharge.

b. Fan intake - To regulate air intake, adjust sliding panels on either end of the air drum.

c. Wind damper - To regulate fan blast, adjust lever attached to one of the horizontal wooden members. The best operating level was at the fifth notch from the left (shut) side.

Step 4 - The material recovered in Step 3 was then sifted through 22-mesh and 40-mesh screens (Figure 8). Egg-size moss particles and eggs, when present, could pass through the 22-mesh screen, but not through the 40-mesh screen.

Figure 8 - Sifting material through a 22-mesh screen.

Step 5 - The material retained by the 40-mesh screen was then fed into a Bates aspirator for final separation (Figure 9). Material was inserted at the top of the aspirator. The useable material was deposited in a pan on one side at the bottom of the machine, while the residue was deposited in a pan on the other side (Figure 10).

Figure 9 - Feeding material into a Bates aspirator.

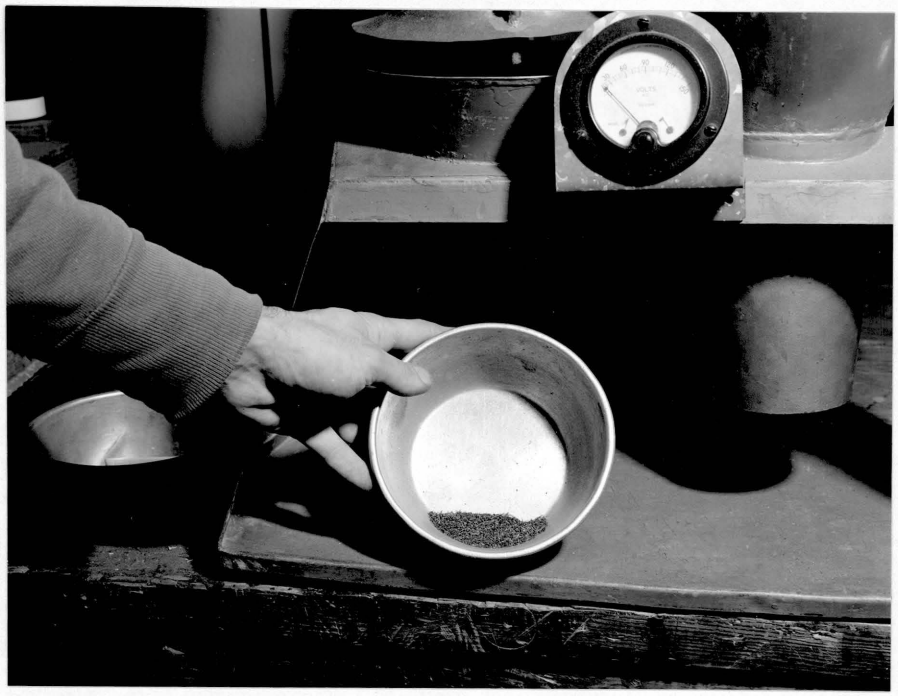

Figure 10 - Useable material after going through a Bates aspirator.

Three adjustments were necessary for proper operation of the aspirator:

a. Feed - To regulate discharge of material, adjust spring-in-slot device. Best setting was "4½" on the dial.

b. Air valve - To regulate air intake of the centrifuge, adjust the metal slide attached to the left front side of the vacuum chamber. Proper setting was two hash marks from the front side of the machine.

c. Voltage regulator - To regulate power output, turn rheostat knob at the right rear side of the aspirator. The best operating level was 70 volts.

The original pound of moss was reduced step-by-step until only a small portion, ranging from 0.5 to 6.0 grams, remained after aspirating (Figure 11). This material was then ready to be inspected for the presence of eggs.

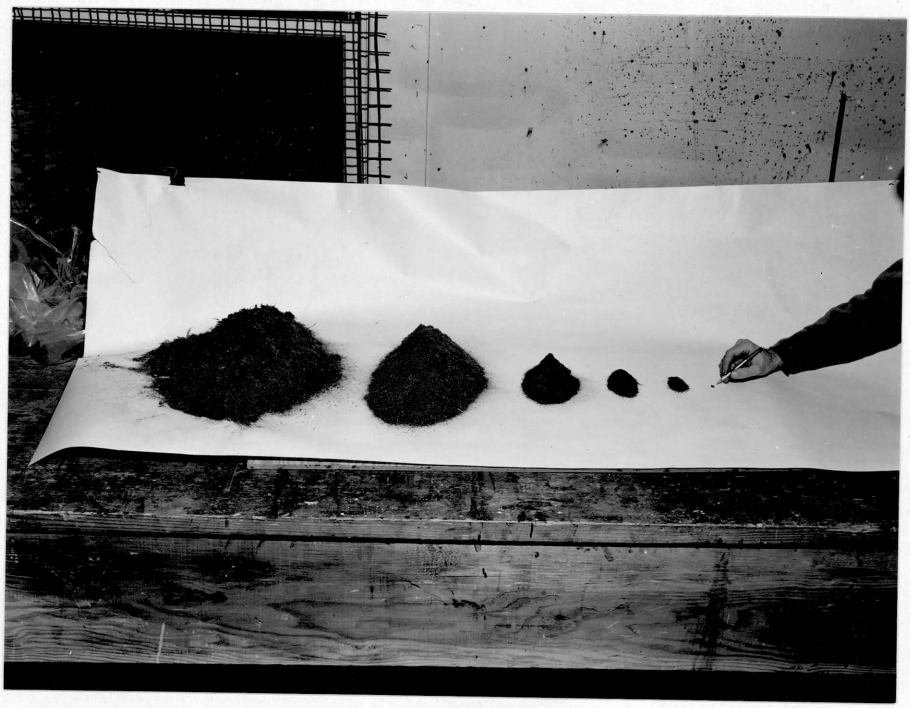

Figure 11 - Step-by-step reduction of moss during processing.

Egg Counting

Material from all 123 samples was examined for the presence of eggs using a binocular microscope (Figure 12). For ease in examination, only a portion of the material remaining after processing of a sample was observed at one time. The number of eggs counted ranged from 0 to 1,499 per pound of dry-weight moss (Table 1). Representative mites and associated mite and insect eggs were preserved for later identification.

Figure 12 - Examining material for presence of western hemlock looper eggs using a binocular microscope.

PROJECT PERSONNEL

The western hemlock looper egg survey was supervised by personnel from the Insect and Disease Control Branch, Division of Timber Management, Regional Office, U. S. Forest Service, Portland. Entomologists W. J. Buckhorn and P. W. Orr selected the sampling points. Mr. Buckhorn devised much of the equipment used in processing samples. Entomologist P. E. Buffam supervised moss collecting and counted the eggs. Forester J. C. Braidwood and Biological Aid R. H. Browne collected moss and processed all of the samples. It took 49 man-days of time to collect moss samples, 35 man-days to process them, and 15 man-days to examine the processed material and count the eggs.

Personnel were supplied by Crown Zellerbach Corporation from Seaside and the Oregon Department of Forestry from Salem and Astoria to assist in moss collecting. E. Pearson, L. Kisska, J. Martin, and W. Berry of the Oregon Department of Forestry and R. Mosar, D. Banks, R. Larsen, P. Hanson, M. King, and C. Quackenbush of Crown Zellerbach Corporation collected moss samples. Mr. Pearson also helped count looper eggs.

Table 1.--1961 hemlock looper egg survey results

Plot no.	No. eggs	Plot no.	No. eggs	Plot no.	No. eggs	Plot no.	No. eggs	Plot no.	No. eggs
1	8	37	1	73	0	101	141	136	0
2	--	38	1	74	0	102	10	137	1
3	17	39	7			103	20	138	2
4	20	40	0			104	4	139	0
5	57	41	0			105	8	140	1
6	43	42	0			106	1	141	2
7	30	43	0			107	21	142	--
8	--	44	0			108	56	143	0
9	10	45	2			109	--	144	2
10	--	46	1			110	1	144-A	2
11	4	47	1			111	6	145	3
12	0	48	11			112	--	145-A	0
13	3	49	0			113	68	146	--
14	3	50	0			114	289	147	--
15	8	51	7			115	292	148	4
16	23	52	191			116	95	149	--
17	--	53	16			117	5	149-A	1
18	0	54	18			118	13	150	--
19	3	55	1			119	--	151	--
20	1	56	4			120	30	152	--
21	18	57	3			121	13	153	9
22	--	58	--			122	--	154	21
23	1	59	1			123	2	155	1
24	--	60	0			124	--		
25	--	61	0			125	11	1/MM 1	552
26	48	62	0			126	1	2	275
27	5	63	--			127	0	3	108
28	0	64	0			128	0	4	725
29	4	65	3			129	--	5	443
30	2	66	1			130	8	6	573
31	0	67	2			130-A	0		
32	0	68	0			131	4	2/BS 1	457
33	0	69	0			132	3		
34	0	70	0			133	2	3/WR 1	85
35	3	71	0			134	0	2	1,499
36	1	72	1			135	0		
								4/TC 1	120
								2	608
								5/PP 1	112

1/ MM = Moos Moos
2/ BS = Bradwood Sale
3/ WR = Wicks Road
4/ TC = Tucker Creek
5/ PP = Perry Parker

APPENDIX

Equipment Used During Processing and Counting

Quantity	Item
1	Viking grain cleaner
1	Bates aspirator
1	Air compressor
1	8-mesh boxed screen
1	11-mesh boxed screen
1	22-mesh boxed screen
1	40-mesh boxed screen
1	Belt sander
1	34"x15"x16" wooden box
1	34"x15" piece of coarse screen
3	Galvanized wash tubs
1	Spring scales
6	3-quart containers
4	1-pint containers
1	14- and 20-mesh screen (for grain cleaner)
2	Respirators
1	Microscope
144	Pill boxes